March 16, 1954 R. E. PETERSON 2,672,037

LIGHTER

Filed Sept. 26, 1949 3 Sheets-Sheet 1

Fig. 1.

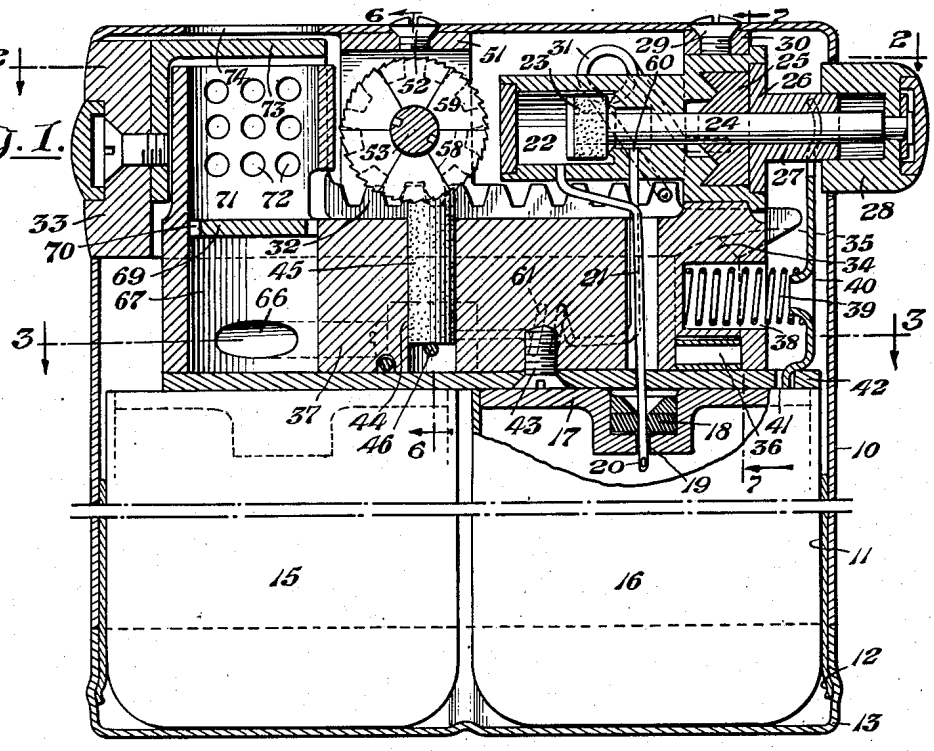


Fig. 2.

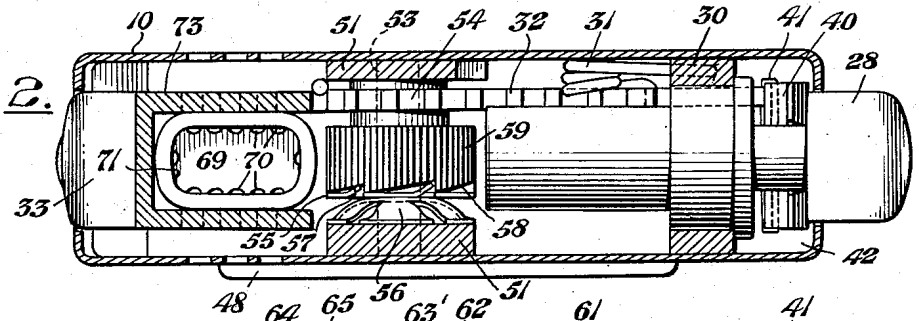
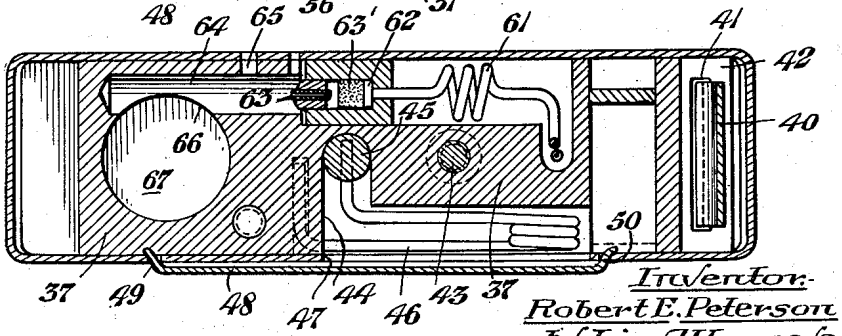


Fig. 3.



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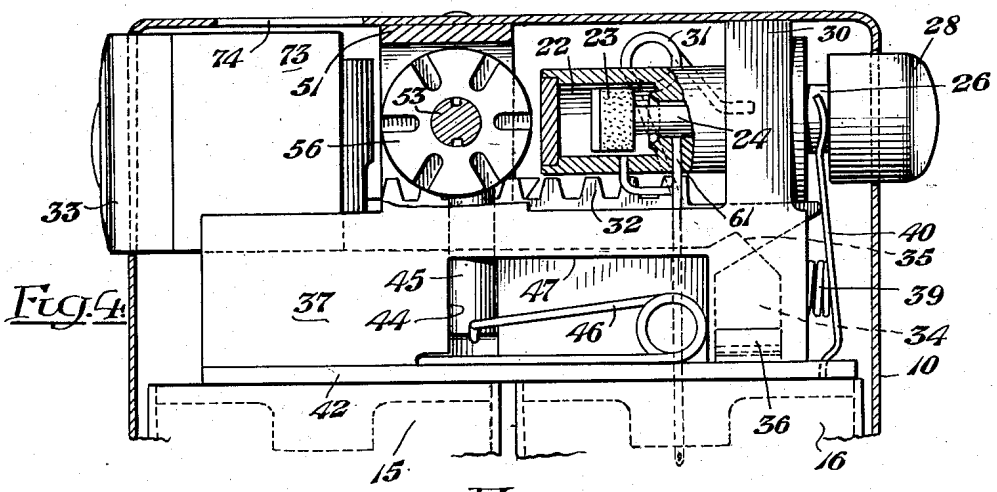


Fig. 4.

Fig. 5.

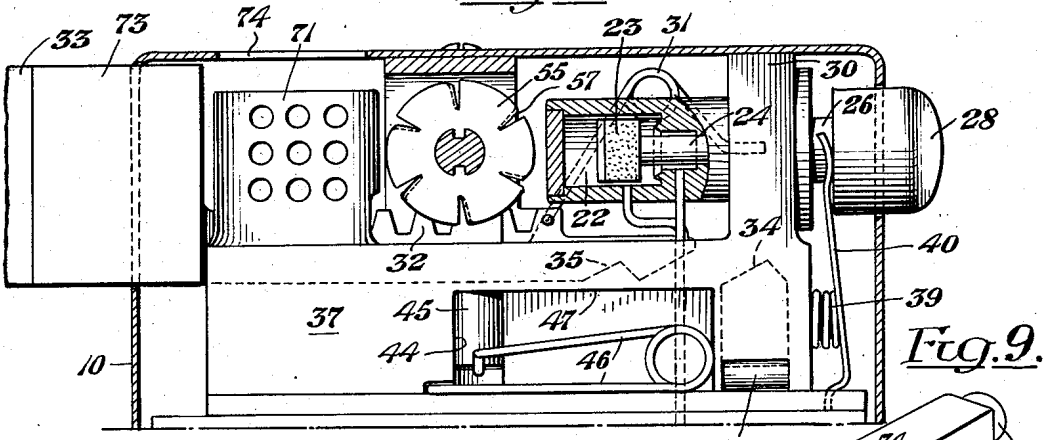


Fig. 9.

Fig. 6.

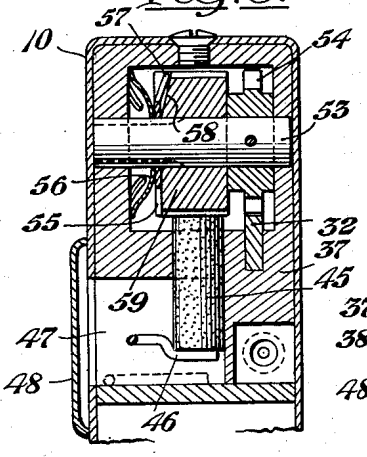
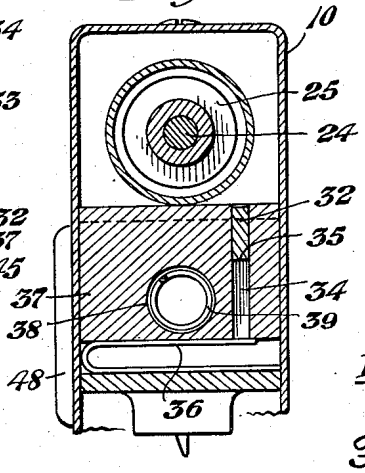
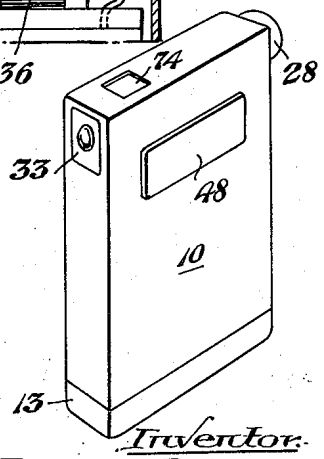


Fig. 2.





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Filed Sept. 26, 1949 3 Sheets-Sheet 3

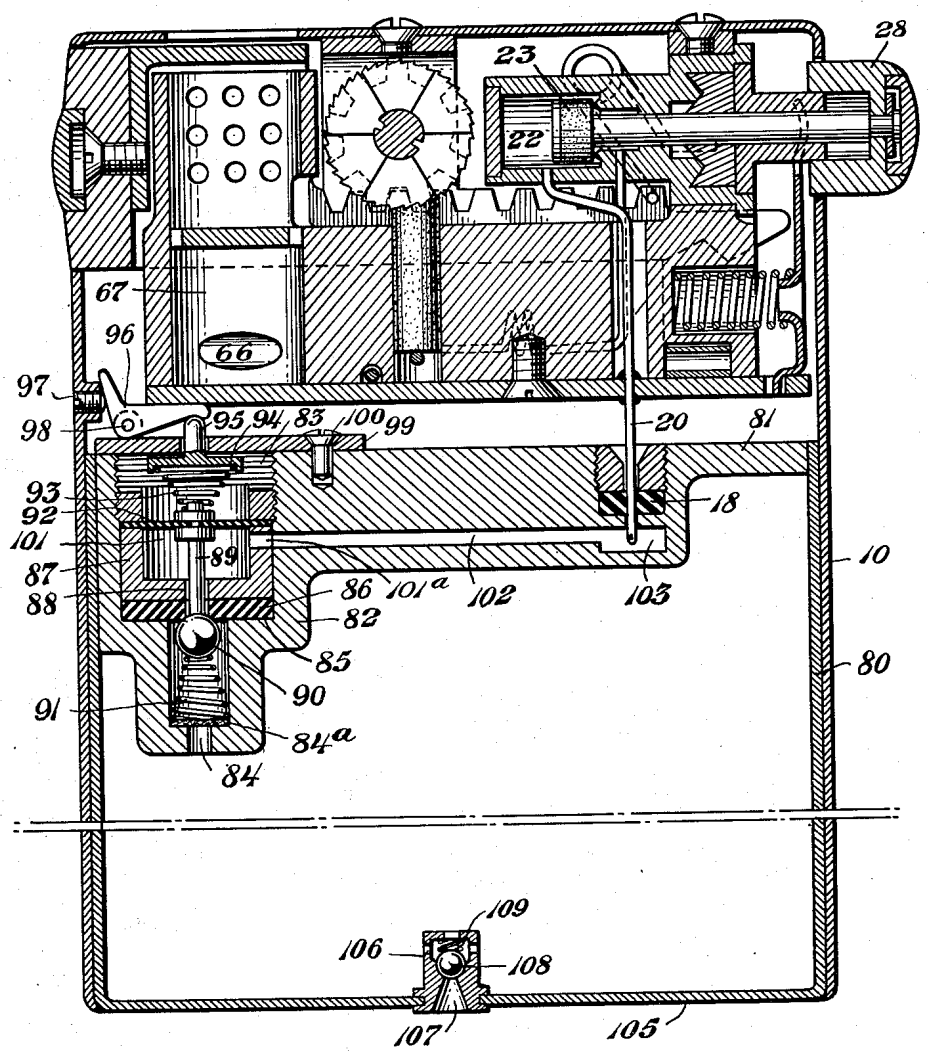

Fig 8.

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LIGHTER

Robert E. Peterson, New York, N. Y., assignor to Repeter Products, Inc., New York, N. Y., a corporation of New York

Application September 26, 1949, Serial No. 117,842

12 Claims. (Cl. 67—7.1)

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The present invention relates to a lighter. More particularly the present invention relates to a pyrophoric lighter especially adapted to utilize a liquefied gas fuel.

In copending application Serial No. 553,701, filed September 12, 1944, to Robert E. Peterson, which matured into Patent No. 2,482,794, there is disclosed a lighter capable of efficiently burning a gaseous fuel such as liquid propane, butane or suitable mixture thereof. The lighter disclosed in the aforementioned application includes as one of its features a carbureting device for intimately admixing the gaseous fuel with air to form a combustible mixture, a mixing chamber and a combustion chamber, together with a suitable igniting mechanism.

One of the objects of the present invention is to provide a novel operating mechanism for a lighter of the character described, which includes a pair of actuating members, one of the members being adapted to cock a spring or springs, released by a second member which also functions to open a gas valve.

A second object of the present invention is to provide in a lighter of the character set forth an actuating manually operating means which is effective to open a gas valve and after a suitable time delay to initiate action of a pyrophoric striking mechanism for igniting gas supplied by the aforesaid valve.

A third object of the present invention is to provide a novel arrangement including a gas supplying means supplying gas through a restricted orifice to a mixing chamber which in turn supplies a mixture of gas and air to a combustion chamber.

A fourth object of the present invention is to provide in a lighter of the character set forth a novel pressure regulating mechanism for controlling the flow of fuel from a fuel tank.

Other objects and the nature and advantages of the instant invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a vertical section through the lighter according to the present invention;

Fig. 2 is a horizontal section taken generally along the line 2—2 of Fig. 1;

Fig. 3 is a horizontal section taken generally along the line 3—3 of Fig. 1;

Fig. 4 is a detail of the operating mechanism, partly in section;

Fig. 5 is a detail, partly in section, of the operating mechanism in a completely released position;

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Fig. 6 is a section taken generally along the line 6—6 of Fig. 1;

Fig. 7 is a section taken generally along the line 7—7 of Fig. 1;

Fig. 8 is a section similar to Fig. 1 of a modified form of the invention; and

Fig. 9 is a perspective view of the present invention.

Referring to the figures of the drawing and particularly Fig. 1 thereof, a lighter is shown provided with a case 10. The case 10 is provided with an inner sleeve 11 having a spring portion 12 projecting downwardly therefrom for receiving a cover 13. Positioned within the lower portion of the case are a pair of gas cartridges indicated at 15 and 16, one of the cartridges 16 being shown in operative relation to the remainder of the lighter. As shown, the upper portion of the cartridge 16 is provided with a cover 17 having a sealable disc 18 inserted within the upper end thereof. The disc 18 normally covers and seals an opening 19 and is adapted to receive a hollow needle 20 which is pushed through the sealing member 18 when the cartridge is assembled with the remainder of the lighter. The needle 20 communicates with a tube 21 which communicates with a valve chamber 22. Reciprocating within the valve chamber is a suitable piston member 23 which is reciprocated within the valve chamber by a piston rod 24. A suitable sealing gasket 25 is provided which serves to prevent exit of gas along the piston rod 24. A bushing 26 is held by an end wall of the valve casing 22 and serves to steady the sliding movement of the rod 24.

Movable with the rod 24 and guided by projection 27 on the bushing 26 is a push button 28 which is suitably fastened to the rod 24 so as to reciprocate the same. The piston chamber 22 is fastened to the casing 10 and retained in position therein as by a screw 29, which passes through the casing, and a frame member 30.

Positioned within the casing 10 is a suitable spring 31 having one end fastened to the frame member 30 as best shown in Fig. 2. The other end of the spring 31 is fastened to a rack 32, the rack 32 being mounted to reciprocate within the casing and forming a part of a cocking button assembly 33. As shown in Fig. 1, the cocking button has been moved to a position to energize the spring 31. The rack 32 and button 33 are retained in this position by a dog 34 fitting into a notch 35 in the lower surface of the rack 32. The dog 34 is seated upon one end of a leaf spring 36, as best shown in Fig. 7, being normally urged

upwardly thereby. The spring 36 is mounted within a block 37 forming a part of the frame 30 previously described.

Fitted in a bore 38 within the block 37 is a coil spring 39 having one end bearing upon the block and a second end receiving an arm 40. The arm 40 is received at its lower end within a notch 41 in a member 42 fastened to the block 37 as by a screw 43. The upper end of the arm 40 is bifurcated to extend on each side of the projection 27 and within the path of the push button 28. Another bore 44 within the block 37 is provided with a conventional flint 45 urged upwardly by a spring 46 (Figs. 4 and 5). Access to the flint and spring is obtained through an opening 47 in a side of the casing 10 which is normally covered by the plate 48 which is fitted into and retained by the notches 49 and 50 within the casing as best shown in Fig. 3.

Extending upwardly from the block 37 is a second frame member 51 which also serves to secure the block within the casing since it receives a screw 52. Journaled for rotation in the frame member 51 is a shaft 53 provided with a pinion 54 rotatable therewith. The pinion 54 meshes with and is rotated by the previously described rack 32. Keyed to the shaft 53 is a clutch member 55 including a spring portion 56 and a pawl portion 57. The pawl portion 57, as best shown in Fig. 2, cooperates with a ratchet 58 formed in the side of a flint wheel 59 which is journaled for rotation on the shaft 53. Movement of the shaft 53, therefore, in a clockwise direction will similarly move the clutch 55 and through the pawl and ratchet the flint wheel 59 in a clockwise direction. Reverse movement of the shaft 53, however, will cause the pawl portion to move over the ratchet teeth 58 so that a new section of the flint wheel 59 will cooperate with the flint 45 at each actuation

The valve chamber 22, previously described, communicates as by a conduit 60 with a capillary 61 and a filter chamber 62 to a restricted orifice or jet 63. Within the filter chamber 62 is a suitable filter plug 63' (Fig. 3). The jet 63 communicates with a header 64 provided with air ports 65. The header in turn communicates through the port 66 with a mixing chamber 67. The upper end of the mixing chamber 67 is closed by a plate 69 provided with a plurality of openings 70 which serve to provide a restricted outlet for the gas and air mixture into the combustion chamber 71 which is also provided with additional openings 72 for more air. The cocking button 33, previously described, is provided with a projecting portion 73 normally interposed between the upper end of the combustion chamber 71 and an opening 74 in the casing.

Referring to Fig. 8, a modification of the present device is disclosed including a cartridge forming an integral part of the lighter assembly and indicated at 80. The cartridge 80 is provided in its top 81 with a sealable disc 18 entirely similar to disc 18 of the previously described modification. A needle 20 is also provided for piercing the disc 18 when the lighter and cartridge are initially assembled.

As indicated hereinabove, and as described in greater detail in my aforementioned copending application, the fuel container 80 is adapted to receive a charge of liquid propane or other liquid gas having similar properties. In other words, the cartridge should be charged with a liquid gas that is maintained in liquid form within the cartridge by reason of its vapor pressure, but which is capable of igniting and burning in the combustion chamber under conditions of wide temperature variations. The pressure of such a liquid in a container is a function of temperature so that the pressure of the fuel whether in liquid or vapor form or both within the container is materially higher at high temperatures than at low temperatures. This, of course, gives rise to a problem as it is important that the pressure of the vaporized fuel issuing into the mixing chamber of the lighter be at a constant value regardless of the surrounding temperature. If the vapor or gasified liquid were permitted to flow into the mixing chamber at inordinately high velocities, as indeed it would where a too high pressure exists in the fuel container the desired air fuel ratio would not be attained and furthermore material difficulty would be had in igniting whatever mixture is created. Where the surrounding temperature is at a very low value the pressure within the fuel cartridge while less than what it would be at high temperature is still higher than the pressure desired at the inlet to the mixing chamber. In other words while there is a wide range in the pressure differential depending on temperature variations there is always more than enough pressure than that needed. Accordingly I have found that it is important to provide at any suitable place in the fuel line between the fuel and the mixing chamber an automatic pressure regulating device by which there may be attained a constant predetermined pressure value condition at the entrance to the mixing chamber and accordingly a predetermined gas velocity thus assuring the creation of a proper air fuel ratio and easy ignition. To this end I have provided an automatic pressure regulating device which will now be described.

The cover member 81 is also provided with a dependent portion 82 having a bore 83 therein. The bore 83 communicates with the remainder of the cartridge 80 as by an opening 84, over which a filter 84a is disposed. This filter not only removes any foreign matter that may be in the fuel but more importantly assists in the vaporization of the liquid fuel. This is particularly so where the lighter is ignited in other than an upright position. Seated on an annular shoulder 85 within the bore is a gasket 86 of preferably a chemically inert material. The gasket 86 is retained in position by a bushing 87 and the bushing 87, as well as the gasket, is pierced by an opening 88. Loosely fitted within the opening 88 is a valve stem 89 having a ball closure member 90 at its lower end normally urged against the gasket 86 into sealing position by a spring 91. The upper end of the valve stem 89 is riveted to a diaphragm 92 which is sufficiently flexible to move under excess gas pressure. The diaphragm 92 is urged downwardly by a spring 93 bearing at its upper end in a cap 94 having a stem 95 extending upwardly therefrom.

It may now be seen that the automatic pressure regulating device is immediately responsive to opening movement of piston 23 by depression of button 28 to effect its regulating function. In other words, when piston 23 is moved to the left the gasified fuel flows into chamber 101 of the pressure regulator and thence through hole 101a into the fuel line leading to combustion chamber 67. If the fuel pressure is at an extremely high value as it would be under a condition of high temperature this pressure is exerted on diaphragm 92 partially relieving the downward pressure of spring 93 and accordingly lifting stem 89 a slight amount. As this stem lifts,

lower spring 91 pushes ball 90 upwardly toward the bottom of gasket 86 to adjust the opening therein through which the gaseous fuel flows. This, of course, results in a reduction of pressure in the fuel line and accordingly a reduction of pressure at jet 63 (Figure 3) adjacent air inlets 65. Hence it follows that regardless of the pressure conditions in the fuel container 80 the pressure regulator diaphragm 92 will respond automatically to adjust the opening in gasket 86 so that under all temperature conditions the opening permits only the proper flow of fuel therethrough.

In order that the pressure regulator may be adjusted there may be provided a rocker arm 96 having one of its legs bearing on the upper end of the stem 95 and the other of its legs bearing against adjustment screw 97 extending through the casing 10. The rocker arm 96 is pivoted at 98 to a cover plate 99 held on the top 81 of the fuel receptacle or cartridge by a screw 100.

In average operation the screw 97 is turned inwardly sufficiently so that the spring 93 urges the diaphragm 92 downwardly so as to move the valve stem 97 downwardly, as well as the ball 90, to a sufficient amount to permit passage of gas from the interior of the cartridge 80 past the ball and into the chamber 101 and from the chamber 101 through the passage 102 to the chamber 103 communicating with the interior of the needle 20. If, however, the gas pressure in the chamber 101 becomes excessive, the diaphragm 92 is urged upwardly to move the valve stem 89 upwardly and seat the ball 90 against the gasket 86 to further retard or prevent passage of gas past the ball 90 and around the valve stem 89. Any desired gas pressure may thus be produced in a uniform manner by proper adjustment of the screw 97. It will be noted further that the bottom 105 of the fuel receptacle 80 forms the bottom of the lighter casing. Inserted within the bottom 105 is a ball valve 106 having a tapered inlet 107, a ball 108 for closing the inlet and a spring 109 bearing on the ball and urging it into closing position. The inlet 107 is designed to receive a suitable charging tube so that the lighter can be charged with a supply of a suitable liquefied gas fuel such as propane, butane or mixtures thereof. The pressure of the gas within the receptacle 80 will normally, together with the spring 109, retain the ball valve in a closed position. The remainder of the lighter is entirely similar to that previously disclosed and operates in a similar manner.

Operation

Referring once again to Fig. 1 of the drawings, it will be noted that the push button 33 is in an inward position so that the spring 31 is under compression and tends to urge the rack 32 to the left. This movement is prevented by the engagement of the dog 34 with the notch 35 in the lower surface of the rack. When the bottom 28 is now pushed inwardly, the rod 24 attached to the button is first moved inwardly to permit passage of gas past the piston member 23. Gas is then supplied from the cartridge 16 through the needle 20, the conduit 21 and the chamber 22 to the conduit 60. The conduit 60, as best shown in Fig. 3, feeds the gas through the capillary 61 which serves to furnish a uniform supply of gas to the outlet or jet 63. The filter 63' also serves to prevent passage of any foreign particles and also to restrict the flow of gas under any pressure surges. The jet 63 feeds the gas into the header 64, drawing air into the header through the ports 65. An initial mixture of gas and air is, therefore, produced, which is fed into the mixing chamber 67 through the opening 66. Within the mixing chamber a better combustible mixture is produced, which is fed out of the openings 70 into the combustion chamber 71. In the meantime, the further movement of the button 28 has caused the arm 40 to come into contact with the end of the rack 32. The end of the rack is forced by the arm 40 to ride over the dog 34 and force the dog downwardly. As soon as the dog is moved out of the notch 35, the rack 32 is quickly moved to the left to rotate the pinion 54. The rotation of the pinion 54 rotates the shaft 53 which in turn will operate the flint wheel 59 to supply a spark from the flint wheel to the combustion chamber. Movement of the rack 32 to the left will also move the button 33 to the left and the projecting portion 73 will uncover the opening 74 in the casing to permit exit of the flame and/or hot air therefrom. Release of the button 28 will bring the piston 23 into sealing position to cut off the flow of gas and extinguish the flame in order to prepare for another cycle of operation. However, the button 33 must also be moved manually to the right to cock the spring 31 and engage the dog 34 with the notch 35.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

I claim:

1. A portable gas fuel lighter comprising a combustion chamber, a gaseous fuel supply means, valve means connected to said combustion chamber and said fuel supply means, ignition means adjacent said combustion chamber, energizable means for operating said ignition means upon release from energized condition, a first manually operated means for energizing said energizable means, latch means for retaining said energizable means in energized condition, and a second manually operated means movable to open said valve means to supply fuel to said chamber and thereafter movable to release said latch means.

2. A portable gas fuel lighter comprising a gaseous fuel supply means, a valve means connected to said supply means for regulating the flow of fuel therefrom, a combustion chamber for burning said fuel, a carbureting means and a mixing chamber connecting said fuel supply means to said combustion chamber, ignition means adjacent said combustion chamber, energizable means for operating said ignition means upon release from energized condition, a first manually operated means for energizing said energizable means, latch means for retaining said energizale means in energized condition and a second manually operated means movable to open said valve means to supply fuel from said supply means to said carbureting device, said mixing chamber and said combustion chamber and movable to release said latch means in timed relation to the flow of fuel into said combustion chamber.

3. A portable gas fuel lighter comprising a casing, a combustion opening in said casing, a combustion chamber adjacent said combustion opening, a gaseous fuel supply means, valve

means connected to said combustion chamber and said fuel supply means, ignition means adjacent said combustion chamber, energizable means for operating said ignition means upon release from energized condition, a first manually operated means for energizing said energizable means, latch means for retaining said energizable means in energized condition, a second manually operated means movable to open said valve means to supply fuel to said chamber and thereafter movable to release said latch means and a closure member for said combustion opening movable to uncover said combustion opening upon release of said latch means.

4. A portable gas fuel lighter comprising a combustion chamber, a gaseous fuel supply means, valve means connected to said combustion chamber and said fuel supply means, ignition means adjacent said combustion chamber, energizable means for operating said ignition means upon release from energized condition, a first manually operated means for energizing said energizable means, latch means for retaining said energizable means in energized condition, a second manually operated means connected to said valve to open the same upon movement thereof and a latch means releasing member in the path of movement of said second manually operable means.

5. A portable gas fuel lighter comprising a combustion chamber, a gaseous fuel supply means, valve means connected to said combustion chamber and said fuel supply means, ignition means adjacent said combustion chamber, energizable spring means for operating said ignition means upon release from energized condition, a first manually operated means for energizing said energizable spring means, latch means for retaining said energizable spring means in energized condition, and a second manually operated means movable to open said valve means to supply fuel to said chamber and thereafter movable to release said latch means.

6. A portable gas fuel lighter comprising a combustion chamber, a gaseous fuel supply means, valve means connected to said combustion chamber and said fuel supply means, ignition means adjacent said combustion chamber including a pinion for rotating said ignition means to ignite gas in said combustion chamber, a rack meshing with said pinion, energizable means cooperating with said rack for moving said rack and pinion upon release from energized condition, a first manually operated means connected to said rack for moving said rack into position for energizing said energizable means, latch means for retaining said energizable means in energized condition and a second manually operated means movable to open said valve means to supply fuel to said chamber and thereafter movable to release said latch means.

7. A portable gas fuel lighter comprising a combustion chamber, a gaseous fuel supply means, valve means connected to said combustion chamber and said fuel supply means, ignition means adjacent said combustion chamber including a pinion for rotating said ignition means to ignite gas in said combustion chamber, a rack meshing with said pinion, energizable means cooperating with said rack for moving said rack and pinion upon release from energized condition, a first manually operated means connected to said rack for moving said rack into position for energizing said energizable means, a spring-pressed latch cooperating with said rack for retaining said rack and said energizable means in energized position, a second manually operable means connected to said valve and movable to open said valve and a latch releasing member in the path of movement of said second manually operated means.

8. A portable lighter of the pocket type comprising in combination a chamber adapted to be charged with a low boiling point liquid fuel which is maintained in its liquid form by reason of its own vapor pressure said fuel chamber being disposed in a case, means forming a mixing chamber in said casing adapted to receive an air fuel mixture of predetermined ratio, means forming a fuel conduit between the interior of said chamber and said mixing chamber, a normally closed valve in said conduit for preventing flow of fuel therethrough, manually operable means for opening said valve, a pressure regulating device operatively associated with said conduit for automatically maintaining the fuel pressure in said conduit at a predetermined constant value when said valve is opened, and igniting means operatively connected to said valve operating means to be actuated by said valve operating means upon operation of said valve operating means.

9. Apparatus according to claim 8 wherein said pressure regulating device includes a diaphragm and a valve, said diaphragm being responsive to pressure within said fuel chamber to control said valve.

10. Apparatus in accordance with claim 5, wherein the combustion chamber and fuel supply means are connected by a conduit which includes a pressure regulating device.

11. Apparatus in accordance with claim 5, wherein the combustion chamber and fuel supply means are connected by a conduit which includes a pressure regulating device, said pressure regulating device including a diaphragm and a valve, a spring being provided biasing said valve toward closed position and disposed on one side of said diaphragm, and a second spring disposed on the other side of said diaphragm and biasing said valve toward open position.

12. Apparatus in accordance with claim 5, wherein the combustion chamber and fuel supply means are connected by a conduit which includes a pressure regulating device, said pressure regulating device including a diaphragm and a valve, a spring being provided biasing said valve toward closed position and disposed on one side of said diaphragm, a second spring disposed on the other side of said diaphragm and biasing said valve toward open position, and adjustable means to vary the bias of said second spring.

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